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(54) CONTROL DEVICE FOR AIR-CONDITIONING INSTALLATION

(71) We, SOCIETE ANONYME FRANCAISE DU FERODO, a French body corporate of 64, Avenue De La Grande-Armee, 75-Paris 17e, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an improved form of device for the control of an air-conditioning installation.

It is known for air-conditioning installation, for example installation of automotive vehicles, to be controlled by means of actuating elements which are provided on the instrument panel and most of which form the end of transmissions terminating at remote elements provided in the air-conditioning installation for regulating the operation thereof.

Safety regulations frequently demand that during the course of their travel the control buttons should not project from the instrument panel to any considerable extent, to risk causing injury to the occupants of the vehicle in the event of an accident.

According to one aspect of the present invention there is provided a device for controlling an air-conditioning installation and comprising a mounting plate, manually grippable, displaceable actuating elements each carried by a carriage which is mounted for movement parallel to the mounting plate, at least one ball being provided for facilitating displacement of each carriage.

In order that the present invention may more readily be understood, the following description is given, by way of example, and referring to the accompanying drawings wherein:

Figure 1 is an elevational view of the device according to the invention;

Figure 2 is a sectional view on a larger scale, taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view along the line 3—3 of Figure 1;

[Price 25p]

Figure 4 is an elevational view similar to that of Figure 1 but at the other face of the device;

Figure 5 is a view similar to that of Figure 1 showing additionally the control panel of the device; and

Figure 6 shows an electrical wiring diagram.

The invention is illustrated in the form of a device for the control of an automobile air-conditioning installation the device comprising a body 10 constituted in the form of a plate made of light alloy in the general form of a quadrilateral bounded by two substantially parallel sides 11 and 12, and parallel lower and upper sides 13 and 14, respectively. The preferred form of plate is a pentagon in which the upper side 14 comprises attaching lugs 15, 16 and 17, the fifth side comprising an oblique portion 18 of the above mentioned lower side 13. The oblique portion 18 has an extension 19.

On the surface 20 of the plate 10 facing the interior of the cabin space of the automotive vehicle are straps 21 and 22 located at the upper portion of the plate and serving for the mounting of a circular cross-section guide rod 23 which extends over the entire width of the plate 10. The rod 23 slidably supports a carriage 24 constituted by a small plate 25 advantageously made of light alloy and provided with a throughpassage 27 for receiving the guide rod 23. The carriage 24 is generally polygonal in shape and is bounded by a vertical side 28, a relatively short upper horizontal side 29, and a lower horizontal side 30 longer than the side 29. The lateral edge of the slide plate 25 opposite to the side 28 has an oblique portion 31 and a vertical portion 32.

The carriage or slide 24 is provided with balls, permitting rolling movement along the main plate 10, and for this purpose comprises housings 33 and 34 for balls (not shown) at the ends of the side 28, a housing 37 at the junction of side 29 and side portion 31 and a housing 38 at the end of the

side 30 opposite to the housing 34, the housings 37 and 38 containing balls 39 held in place by tongues 40 (see Figure 2).

Each of the various balls co-operates with a respective one of two parallel V-section guide tracks 41 and 42 comprising oblique walls 43 and 44, respectively, and extending substantially along the entire width of the plate 10.

Figure 2 shows that the carriage 24 has an integrally formed tab 45 substantially perpendicular to the plate 10 and having an actuating button 47 mounted on the end 46 as shown in Figure 2. The button 47 is disposed in front of a fascia or control panel 48 which is provided with a slot 49 for the tab 45 to extend through.

The carriage 24 also carries a fixed pin 50 engaged in a slot 51 of a bell-crank 52 mounted for rotation about a pin 55 integral with the plate 10. The bell-crank 52 comprises a first arm 53, and a second arm 54 the end 56 of which is connected to a cable 57 of a Bowden transmission 58. The transmission 58 may for example be designed to control a shutter for the distribution of conditioned air downwardly or upwardly into the cabin space, as designated in Figure 5 by symbols 59 and 60 bordering the slot 49. The above mentioned strap 21 serves as an abutment for one end position of the carriage 24 corresponding in downward flow of air into the cabin space.

A second carriage or slide 70 also co-operates with the guide rod and has a generally polygonal form comprising at its corner housings 71, 72, 73 and 74 each of which accommodates a ball for co-operating with the above mentioned tracks 41 and 42 only balls 76 and 78 in housings 72 and 74 being shown in Figure 3. The carriage 70 also has a throughpassage 81 for the guide rod 23, and furthermore includes a tab 83 bent-over at right angles and fitted with a button 85 at its end 84. The tab 83 extends through a slot 86 in the fascia panel 48 as shown in Figures 2 and 5.

The body 82 of the carriage 70 also carries an electrically conductive strip 88 insulated therefrom by a plate 87 of non-conductive material and having one lug 89 co-operating with a conductive pad 90 fixed to the plate 10 through the agency of an insulating strip 91. The pad 90 has two perpendicular arms 92 and 93, respectively, and another lug 94 of the strip 88 can make electrical contact with either the arm 93 or further conductive strips 95, 96 and 97 to drive a ventilation fan motor 98 of the air-conditioning installation (Figure 6) at different speeds selected through the agency of a resistance box 99. The pad 90 is also connected by a conductor 100 to a thermostat 101 (Figure 6) controlling a compressor 102 of the air-conditioning installation refri-

gerator. The strip 88 is connected to the current source by a conductor 103.

The slot 86 is bordered by varying width illuminated marks 104 to 108 so arranged that the motor 98 is inoperative when the button 85 is opposite the mark 104, driven at a low speed when the button is opposite the mark 105, and driven at progressively increasing speeds as the button is displaced progressively rightwards towards the right-hand end of the mark 108 (Figure 5). The strap 22 serves as a stop for the right-hand end position of the carriage.

Figures 2 and 4 show that a further guide rod 113 is disposed at the upper position of the other face 110 of the plate 10. The rod 113 is fixed by straps 111 and 112, and has its axis in the same horizontal plane as the axis of the rod 23. These straps 111 and 112 correspond to the straps 21 and 22. A further carriage 114 has the guide rod 113 slidably received in a throughpassage 115 and is thus movable along the guide rod. The carriage 114 is generally rectangular in form, with vertical sides 116 and 117 and horizontal sides 118 and 119. At its corners are housings 120, 121, 122, 123, in each of which there is accommodated a respective ball, only balls 124 and 126 in housings 120 and 122 being shown in Figure 2. A pin 129 mounted on a rib 128 of the carriage 114 extends through a slot 130 in a tab 131 at the end of an arm 132 of a plate 133. The plate 133 has the general form of a circular sector mounted for rotational movement about a pin 134 mounted near the lower edge 13 of the plate 10.

Fast with the carriage 114 is a tab 135 bent over at a right angle and having a button 137 on its end 136. The end 136 of the tab extends through a slot 138 in the fascia panel 48.

A stud 139 fast with the sector plate 133 is attached to the cable 140 of a Bowden transmission 141 for controlling the thermostat 101 of the refrigerator compressor 102. A second stud 142 of the sector plate 133 is attached to the cable 143 of a further Bowden transmission of controlling a thermostatic cock of the air heating heat exchanger of the air-conditioning installation.

The perimeter of the sector plate 133 includes a circular portion 144, whose centre of curvature is on the axis of rotation 134 of the sector plate, and which is connected with one side 145 of the arm 132 through the agency of a recess 146 of smaller radius. Co-operating with the circular portion 144 and the recess 146 is a wheel 147 carried at the end of a crank 148 mounted for rotational movement about a pin 149 fixed to the plate 10. A surface 150 of the crank 148 co-operates with the actuating element 130

151 of a vacuum switch 152 connected to a vacuum source by a pipe 153, and controlling a pneumatic jack by way of a pipe 154.

5 At the other side of the arm 132 the perimeter of the sector plate 133 includes a first circular arc 155 centered on the pin 134 and separated from a second arc 156 by a recess 157 of smaller radius. A wheel 158 carried at the end of a crank 159 co-operates with the arcs 155 and 156 and the said recess 157 the crank 159 being is mounted for rotational movement about a pin 160 fixed on the plate 10. A surface 161 of the crank 159 serves to displace an actuating element 162 of a vacuum switch 163 connected to the above mentioned vacuum source by a pipe 164 and controlling a further pneumatic jack by way of a pipe 165.

20 A small block 170, rotatably carried by a pin 171 mounted on the plate 10, slidably receives a rod 172 having an intermediate shoulder 173 and extending through a small block 174 rotatably mounted on a pin 175 carried by the sector plate 133. A spring 176 interposed between the block 170 and the shoulder 173 is subjected to strain towards the end of the travel of the tab 135 and contributes to permitting the displacement of the said tab and the accompanying parts under a substantially constant force to be exerted by the user. Resilient means may alternatively or additionally be provided to afford a constant resistance to motion of the carriage 24 during manual operation of the actuating button 47.

30 From its central position in the median plane 190 of the plate 10, (Figure 5) the displacement of the button 137 leftwards as seen in the Figure corresponds to the progressive increase in the heating intensity, as indicated by gradually increasing height of the band 191 from its centre-most end 192 to its outermost end 193.

45 Displacement of the button 137 rightwards, from its central position on the median plane 190, permits regulation of the intensity of the cooling action from a minimum value when the button is opposite the narrow end 194 of the band 195 to a maximum value when it is opposite the wide end 196.

50 Outlet orifices provided above the fascia panel 48 form outlets for air which has not been conditioned or is only slightly conditioned, the opening of these orifices being dependent on a control lever 203 shown in Figure 5.

60 The air-conditioning installation comprises a tubular conduit 204 for feeding conditioned air towards the upper portion of the cabin space, and a distribution box 205, for conditioned air for the lower portion of the front seats and outlets 208

205 has outlets 206 and 207 for air-conditioning of the front seats and outlets 208 and 209 for air-conditioning of the rear seats.

70 The above described control device is notable for the fact that the controls have an easy action over the entire travel of the control buttons, thus permitting their actuation by the user under the best conditions while at the same time giving the assurance 75 that in none of their positions is any great effort required to shift these buttons. The position reached for one Bowden transmission is maintained until the next subsequent actuation by the user. The balls carried 80 by the carriages co-operate with a plate, thus providing easy guidance without complicating the construction or assembly.

85 If desired more than one guide rod may be associated with each individual carriage. However it is considered that a single guide rod is adequate support for ensuring that the balls of the carriage always engage the associated guide tracks.

WHAT WE CLAIM IS:—

1. A device for controlling an air-conditioning installation and comprising a mounting plate, manually grippable, displaceable actuating elements each carried 95 by a carriage which is mounted for movement parallel to the mounting plate, at least one ball being provided for facilitating displacement of each carriage.

2. A device according to claim 1, 100 wherein each carriage is mounted on a guide rod which extends therethrough.

3. A device according to claim 2, wherein the or each guide rod is fixed to the mounting plate and lies transversely of the 105 carriage mounted on it.

4. A device according to claim 3, wherein a single rod serves for guiding several carriages.

5. A device according to claim 4, wherein the plate carries a guide rod on one face and a guide rod on the opposite face. 110

6. A device according to claim 5, wherein there are at least two guide rods which have their axes in a plane perpendicular to 115 that of the plate.

7. A device according to any one of claims 1 to 6, wherein the balls are received in housings provided on each carriage and the plate includes guide tracks co-operating 120 with the balls.

8. A device according to claim 7, wherein the or each guide rod and the guide tracks extend over the entire width of the plate measured parallel to the direction of motion 125 of the associated carriage.

9. A device according to claim 7, wherein the guide tracks are V-section grooves.

10. A device according to any one of claims 3 to 9, wherein the or each guide 130

rod is fixed to the plate by means of straps which serve to limit the travel of a carriage.

11. A device according to any one of claims 1 to 10, wherein the carriages are operably connected to control remote parts of the air conditioning installation by linkages supported on the mounting plate.

12. A device according to claim 11, wherein the mounting plate also carries switch contacts co-operating with corresponding contacts carried by one of the carriages.

13. A device according to any one of claims 1 to 11, wherein the plate carries fluid circulation control switches for a pneumatic transmission system.

14. A device according to claim 13, wherein said pneumatic system switches are vacuum switches.

15. A device according to any one of claims 11, 12, 13 and 14 and including resilient means for providing a constant

deliberate resistance to motion of the carriages during manual actuation of the actuating elements.

16. A device according to any one of the preceding claims and including a panel mounted on the mounting plate and having projecting through slots in the panel the manually operable actuating elements.

17. A control device for an air conditioning installation such device being constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

18. A vehicle including a control device according to any one of claims 1 to 17.

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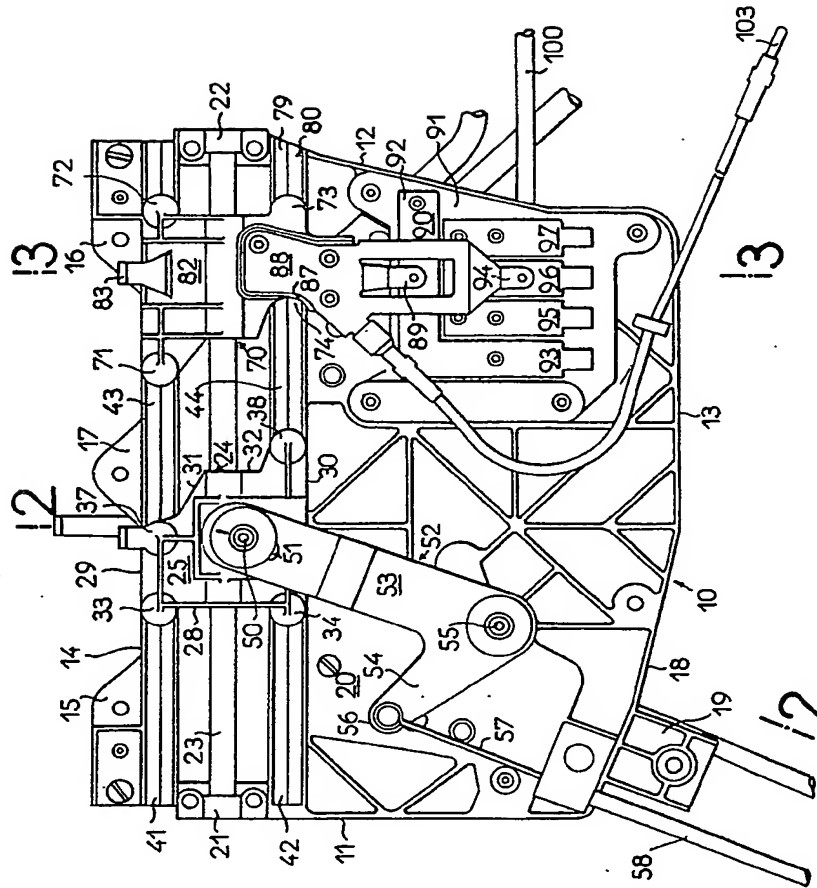


FIG. 1

FIG.3

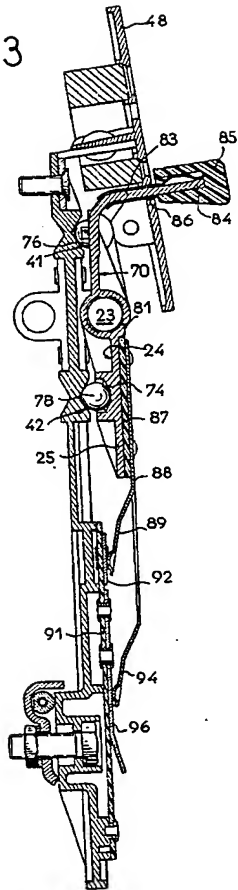


FIG.2

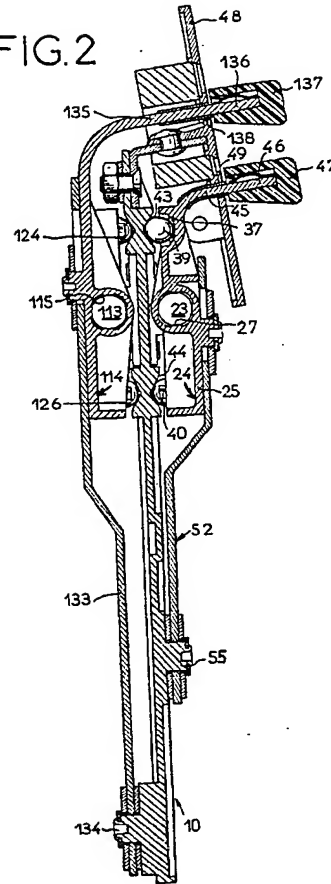
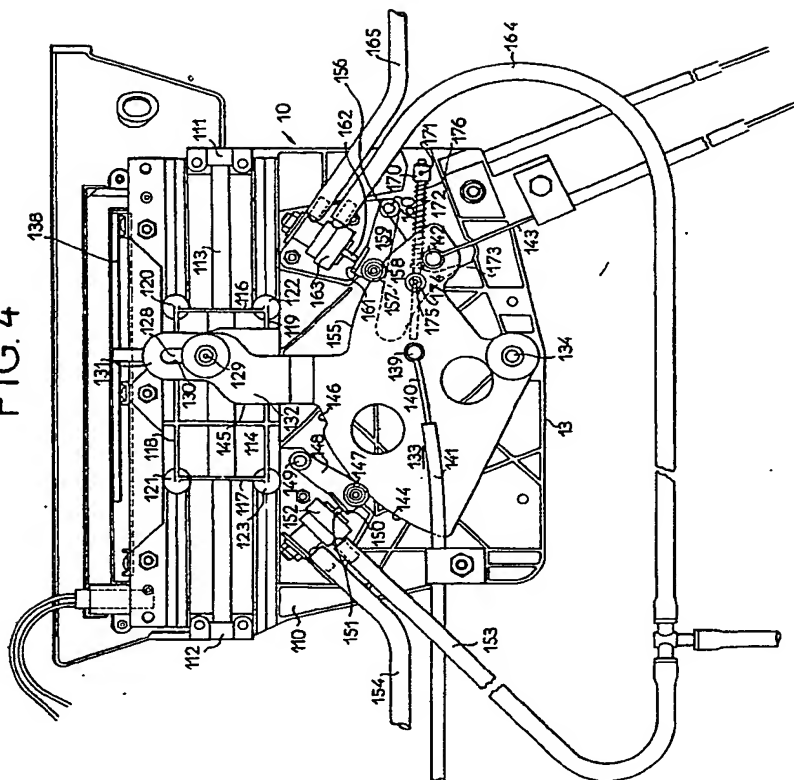


FIG. 4



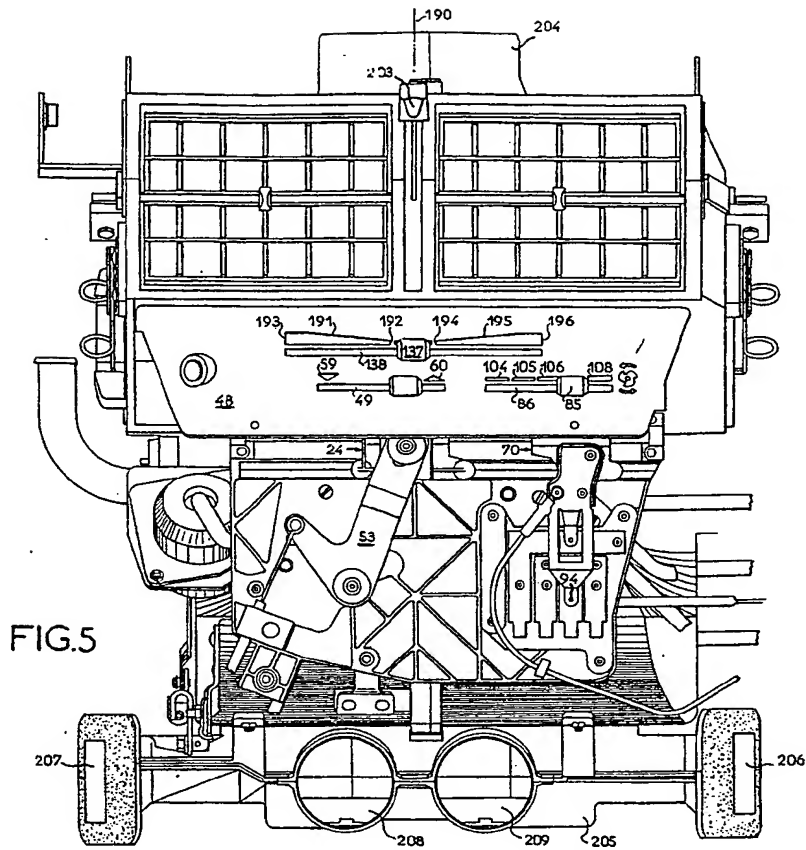
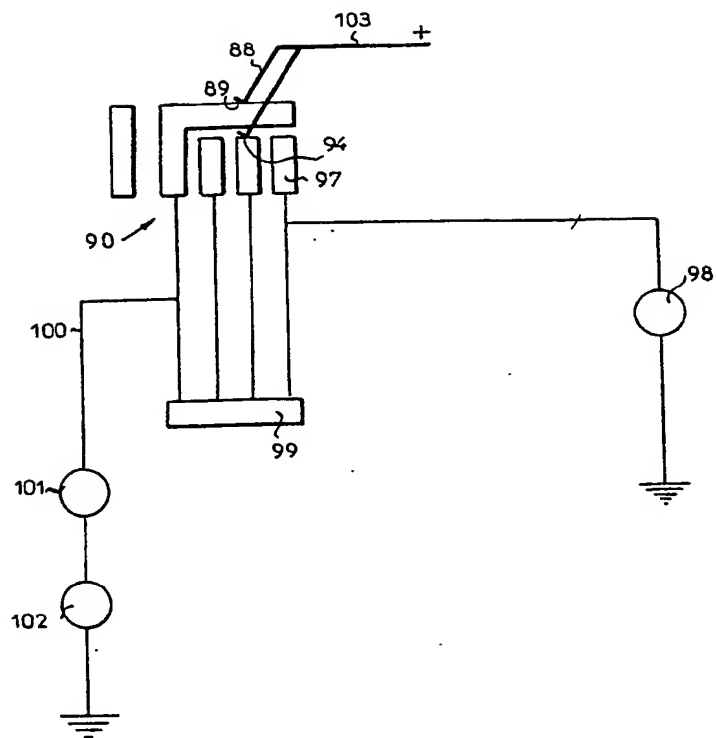


FIG. 6



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